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ABSTRACT

A program for national educational evaluation was established in Sweden in 1989. In 1992, a second data collection was carried out. The program is designed to serve national and local purposes of evaluation. One concept that has been emphasized strongly is an "explorative way of working." Evaluating an explorative way of working is a complex problem that has been addressed through a problem-solving task. A test of this approach was conducted in 1992 with 51 classes of ninth graders divided into 239 groups of 4 to 5 students. Students were asked to solve a problem involving acidification and their problem solving approaches and results were studied. Half the groups kept to the problem but the other half expanded their focus, showing a lack of stringency and concentration. Forty percent of the groups did not make any penetrating study to answer any of the posed questions. Twenty-five percent of the groups followed their own plans and treated only the questions they planned to address. Students showed little independence in relation to their information sources, and barely half of the groups carried out an investigation. When they were made, investigations were usually well prepared with regard to the form of the report, but they were usually not adequate with regard to content. Half of the groups organized their work well, and teachers thought the working atmosphere was favorable in 80% of the groups. Overall, results show that students have not reached the goals set up by the planners for an explorative and critical way of working. Implications for the improvement of teaching and learning are discussed. (Contains one figure and four references.) (SLD)

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ED 410 250

EVALUATING AN INNOVATIVE PROGRAM THROUGH THE PROBLEM-SOLVING TEST IN THE SWEDISH NATIONAL ASSESSMENT PROGRAMME 1992.

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The context of the problem-solving test

A programme for national evaluation was established in Sweden and set to work in 1989. In 1992 a second data-collection was carried through. The programme is centrally initiated and administered. It aims at delivering results to central authorities on the standard of the Swedish schools. But it´s much more complex than such programmes usually are. It covers the whole range of the curriculum from the three R:s to Music, Crafts and Arts among others.

The programme also has the ambition to drive development on the local school level.

The programme thereby exists in a field of tension between two traditions of evaluation. In the first tradition, which is summative and productoriented, the interest is to control the effectiveness of the educational system and to assess students´ basic skills. The aim is effective resource allocation and legitimation of political decisions. This kind of evaluation has been critizised for its simplistic view of knowledge illustrated by test items that focus on surface level rather than on understanding.

The other tradition centers on the potentiality of evaluation as a means for the local school itself to develop its own processes, understanding and professional resources. The focus is on understanding. This means a quest

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for more complex information than is usually produced by the summative approach.
A greater variety of test items are being developed measuring aspects like critical thinking, understanding, social skills, valuing, applying principles etc. The actual programme gives a broad range of items trying to measure such qualities in subjects like mother-tongue, English, mathematics, social sciences and music. The wish to describe schools and their achievements in a deeper and more authentic way opens for a new discussion on measurements, methods, validity and reliability. Any program at a national level will only put forwards problems from the national perspective . The goals of the teaching, the students´ achievement and the teachers competence are looked upon in a general way. It´s important that local evaluation starts at the local level, is interpreted at that level and used in its own context (Figure 1). The main relation between a national evaluation programme and local evaluation is that both can point out some important problems, problems that can be looked upon from both perspectives, but not in the same way.

Figure 1

The curriculum and the problem-solving test

One concept that is strongly emphasized by the Curriculum for the Swedish 9-year Compulsory School (Lgr 80) is "an explorative way of working ". It is desirable that the national assessment programme should reveal whether an explorative working method has been initiated in the schools, and to what extent.

The curriculum states that the students should gradually build up the habit of working with progressively larger work tasks throughout their school life. They are to be given the opportunity to work with studies based on particular topics and to apply more time-consuming working methods involving taking responsibility for more comprehensive work tasks.
The curriculum maintains that learning to cooperate with other students in sharing out tasks, organizing reports and taking responsibility for classmates in need of help is part of a democratic upbringing. The students need to practise rational argumentation, critical examination of simplified statements and listening to others' points of view. The students should be encouraged to adopt a reflective approach by practising it themselves. The curriculum talks of training problem-solving, learning to select relevant information and drawing logical conclusions. It talks of acquiring knowledge through carrying out one's own investigations. The students should be urged to work critically, reflect, pose their own questions, learn to sift, organize and present material.

The problem-solving test attempts to get at both products and processes. It gives the students a chance to show their ability to plan and take responsibility for a larger work task. The test tells us how the students have shared out the work tasks in their groups and how they have organized their report. We can also see whether the students have reflected over the results of their work. We are trying to use the problem-solving test to obtain answers to the question of how critically the students have sifted their observations and how they have made use of them and organized them. We can find out what questions the students have posed, how they have designed and carried out an investigation, and what conclusions they have drawn from it.

The test

The problem-solving test is a task with many degrees of freedom, i.e. a very open task, in which the students have to decide themselves on several occasions how to carry on. The problem is not given. The problem area is outlined but the students have to select a question, break it down and define it more exactly. The students themselves have to choose the investigation, and design and implement it in the way they decide themselves. The implementation is entirely open. The answer is open, i.e. there is no key available. The answer depends on the question asked. The form and content of the report are decided by the teams of students.

The test was conducted in the spring of 1992 in 51 classes, Grade 9. The students worked in groups (239 groups) for 8 lesson hours, divided into two work sessions separated by an interval of one week. A short description follows:

A short video film introduced the class to the problem area *acidification*. The group task was placed in a real context and tried to give the students an idea of what was expected of them.

The class was divided into groups of 4 to 5 students, using the class register.

Each group received a letter, written in English, with a number of questions.

They were given the work task in written form: the idea is to select a question and answer it. The answer has to be based on a small investigation. The form of the answer is optional; it may be a letter, an audio tape, a poster etc.

Each group was asked to describe their work in a worksheet. The design of the worksheet also gave the group the chance to choose what they wanted to talk about in, for example, their planning.

Each group had a selection of books and the class had a small reference library at its disposal.

The two teachers were not supposed to interfere in the working process, but assist with any material required, answer factual questions, etc. They were also required to observe and assess the working process in one of the groups.

Both students and teachers filled in a questionnaire afterwards.

All parts of the multi-dimensional instrument contained open questions and provided ample opportunity for students and teachers to describe their work in their own words.

General Results and Conclusions

The problem-solving test made it possible to collect data on the students' ability to solve problems and to work in groups.

The students´ability to solve problems

The ability of the students to limit themselves and to keep to the subject.

Half the goups have kept to the problem of acidification. The other half have not confined themselves to the set problem of acidification, but have extended the problem to include every possible environmental problem, thereby showing a lack of stringency and concentration.

60% of the groups have answered at least one of the set questions well. Thus, 40% have not treated any question at all well, either any of the ones set or their own. They have, however, treated questions in a superficial way by mentioning something in a single sentence. It is unsatisfactory that 40% of the student groups have not made any penetrating study in order to support an answer to any of the questions..

25% of the groups have followed their plans completely and treated the questions they intended to, no more, no less. All these groups have limited themselves to a set question. 15% of the groups have followed their plan and treated both the questions they had thought of from the start and a few more. 60% of the groups have not followed their plans and have treated other questions.

A plan is meant to help each group in their efforts to structure their work. It is more important to follow a plan that has been drawn up in a group in a process involving democratic decision-making than to follow a private plan. That the majority of the groups have not followed their plans is therefore unsatisfactory.

The independence of the students in relation to information sources

The students show little independence in relation to their information sources, when they are written. It is evident that most students copy long passages from books and broschures without sifting the information. Thus, they do not make use of their mental resources and critical ability. The students show greater independence in relation to persons as sources of information. They then have questions for them, which is not the case with texts. They often refer to the persons interviewed instead of reproducing exactly what they have said. 8% of the groups have shown signs of examining information in a critical fashion. The teachers are of the opinion that 60% of the observed groups work in a rather uncritical fashion.

The students' capacity to collect information by means of an investigation and to make a report

Barely half the student groups carried out an investigation. Seven classes made no investigation at all. In three classes there was an average of one investigation per group. The investigations may be described with the help of four "qualities":

1. The investigation is based on a question or tests a hypothesis.
2. The investigation is described so well that it is reproducible.
3. The student group has commented on something in connection with their investigation, e.g. difficulties or unexpected results.
4. The student group attempts to provide an explanation for the results obtained from their investigation.

Of the investigations performed, one third have been based on a question or tested a hypothesis. For about one quarter of the investigations a description of the method has been given, i.e. the group has described the steps they took. Comments have been made on one quarter of the investigations. This low figure is yet another indication of how little the students reflect over their work. Only 10% of the groups have attempted to explain the results of their investigations.

Differences in how well the *classes* reported their investigations may be seen: in 25% of the classes the groups' investigations have none of the four qualities described, in one class the group investigations have an average of 2.75 qualties, while in 50% of the classes the investigations show on average at least 0.5 qualities.

The differences in how well the *groups* succeeded in carrying out and reporting their investigations is brought out in that one third of the investigations lacked all the qualities described, while nearly one tenth of the investigations have three or four qualities.

The students' ability to see their work in a wider context than that of school.

The purpose of the problem-solving test was that the students' work should be placed in a meaningful context. Most of the groups dutifully solved their problems just like any other school assignment, without reflecting over whether it should function in a wider connection than that of school. (One class rebelled, however, i.e. they reacted strongly to the open problem-solving task that was set, refused to work at first, but got started anyway and submitted their report). At least one third of the groups thought of tests when working on the tasks, but at the same time made sure that what they were doing would not affect their grades. The teachers' comments confirm that motivation was less when the students noticed that the work with the problem-solving test would not be marked in the normal way. 15% of the groups directed their answer to a recipient, the person who posed the question, i.e. placed their work in the given context.

The students' ability to report on their work.

The students' reports have been assessed according to five aspects: structure, neatness, how the form of the report (letter, audio-tape, etc.) has been used, independence in preparing illustrations and the amount of work involved. Half the group reports have some structure, while 90% of them are neat and easy to read. Two-thirds of the groups have used the form well. 75% used illustrations. Just over a third of these only copied illustrations, while another third (just under) generally prepared their own. 80% of the groups put in a normal, or more than a normal, amount of work in relation to the conditions. 50% of the reports reach a good standard with regard to at least four of the five aspects.

The students' ability to report on their work is satisfactory as far as the form of the report is concerned. As regards the content of what is reported, the situation is different. This is brought out when the groups described their investigations. There are no signs of hypotheses, insight into method and a reflective attitude.

The students' ability to work in groups

According to the teachers' assessment, 50% of the groups organized their work well. 75% of the students were satisfied with the organization of their group. The teachers find that the working atmosphere was favourable in 80% of the groups, while 80% of the students were also satisfied with the atmosphere in their group. In one tenth of the groups at most, the division

of labour caused high feelings among the students, largely due to lack of solidarity with regard to sharing the work equally.

The results from the problem-solving test allow the following conclusions to be drawn concerning the students' ability to work in groups. The students' ability to organize their work in groups, so that the group functions socially, and so that a product is finished, is satisfactory. In other words, the students' ability to work towards a good working atmosphere in the group is good. A group would, however, be able to gain even greater satisfaction from its members if they had the ability to use an exploratative working method.

Possibilities

The result of the assessment shows that the students have not reached the goals set up by Lgr 80 for the 9-year compulsory school regarding an explorative and critical way of working. Is it possible for the students to improve?

The answer depends on what explanations there are for the result obtained from the assessment. The most likely hypothesis is that the result may be attributed to the teachers making too small demands on the students as regards processing skills. The students could take a greater part in actively planning their own work. They could work with more unstructured tasks so that they are forced to delimit and formulate their problems themselves. The students could select their sources of information more freely and also be trained to examine them critically. They could work with less regulated, and therefore more realistic, contexts. The students could have greater freedom to select their method of investigation, while learning to criticize this selection.

Swedish teachers too seldom make use of known methods for developing the students' problem-solving ability and training them in an explorative way of working. They do not make use of all the opportunities for learning afforded by group projects. The teachers are probably unaware of the findings of modern research in this respect.

It is therefore necessary to set some time aside to give teachers the chance to acquaint themselves with various methods. Continuation courses should be provided in this area as well. It is important to encourage private initiative where teachers want to test new methods. In view of their widespread influence on education, compulsory school tests and national assessment must include problem-solving tasks.

This type of measure should enable schools to become better at developing the students' explorative and critical working method and making them better at solving more comprehensive problems in groups.

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GOVERMENTAL DECISIONS FUTURE
SCHOOL PLANNING AND DEVELOPMENT

NATIONAL ASSESSMENT PROGRAM
(AGGREGATED DATA)

* GENERATE QUESTIONS AND POSSIBLE ANSWERS
* THEORY BUILDING
* DEVELOPMENT OF NEW METHODS

THEORY (FRAME OF REFERENCE)

WHY?

LOCAL COORDINATORS FOR NAP

IN-SERVICE TRAINING

SCHOOL-BASED EVALUATION
("TEACHER AS A RESEARCHER")

HOW ARE THE CONDITIONS ON OUR SCHOOL?